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Original Research Article

Prevalence of asymptomatic bacteriuria among pregnant women in different trimesters

Dhanya M., Tamilselvi D., Bhavani Sree K. P.*

Department of Obstetrics and Gynaecology, Panimalar Medical College Hospital, Chennai, Tamil Nadu, India

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***Correspondence:**
Bhavani Sree K. P.,
E-mail: dhanyakiran94@gmail.com

ABSTRACT

Background: Asymptomatic bacteriuria (ASB) occurs in individuals of all ages.
Methods: A cross-sectional study was conducted for a period of 6 months from February 2024 to August 2024 at Panimalar Medical College Hospital and Research Center that included 130 antenatal women presented for regular antenatal check-up in OG OPD. Graphpad Prism (vs. 9.2.0). was used for data analysis in which $p \leq 0.05$ was considered statistically significant.
Results: The overall prevalence of ASB was 33.1%.
Conclusions: The incidence of ASB was 33.1% which is still lower as reported in other Indian studies. Age, socioeconomic class and trimester were not found to be associated with ASB. The most common organism isolated was *E. coli*, followed by *S. aureus*, *Klebsiella*, *Proteus*, and equal incidence of *Citrobacter* spp. and *Pseudomonas*.

Keywords: Asymptomatic bacteriuria, Pregnancy, Urinary tract infection, *E. coli*, *S. aureus*

INTRODUCTION

Asymptomatic bacteriuria (ASB) is a condition in which urine culture reveals a significant growth of pathogens greater than 10^5 bacteria/ml of urine, and the patient does not have any telltale symptoms like frequency, urgency, dysuria, pyuria, or hematuria.[1] ABU is a global health problem prevailing in all the age groups and existence has been reported between 2-10%.[2] The prevalence of ABU ranges from 2% to 15% in the developing countries, while a lower prevalence of 2%-7% is seen in the developed countries.[3] However, some studies in India have also shown a higher prevalence rate of 17% in Andhra Pradesh and 25.3% in Odisha.[4] Bacteriuria may be either an ASB or symptomatic (acute cystitis and acute pyelonephritis).[5] Symptomatic urinary tract infections are divided into lower tract (acute cystitis) or upper tract (acute pyelonephritis) infections. Cystitis is defined as significant bacteriuria with associated bladder mucosal invasion, whereas pyelonephritis is defined as significant bacteriuria with associated inflammation of the renal parenchyma, calices and pelvis.[6] The changes occurring in the pregnant women to accommodate the fetus make them more susceptible to ABU when compared to the age matched non-pregnant women. The urethra of the women is very short so it lies in the close proximity to the vagina which is exposed to the flora of the anal canal there by increasing the susceptibility of the females to ABU.[7] The hormonal milieu of women in the pregnancy leads to relaxation of the smooth muscle of the bladder, ureters there by increases the bladder volume and decreases the tone of ureter and bladder. The decreased tone of the ureter leads to mild hydronephrosis and urinary stasis.

METHODS

A hospital-based cross-sectional study conducted in department of obstetrics and gynecology, Panimalar medical college hospital and research center, Chennai. The Study was conducted for a period of 6 months from February 2024 to August 2024. The study population included were recruited that fulfilled the below-mentioned

inclusion and exclusion criteria. Inclusion criteria are Antenatal women presented for regular antenatal check-up in OG OPD. Antenatal women who do not have urinary symptoms. Patient with written informed consent by patient/guardian. Exclusion criteria are patients with history of UTI in the past one year or during this pregnancy. Patients who had taken antibiotics in the last 6 months. Patients who are not willing for participating in this study. The Sample size was calculated on the basis of following formula: $N=(Z\text{-score})^2\times p(1-p)/(e)^2$

N=Sample size, Z-score=critical value for standard normal distribution (1.96 for confidence level 95%), p=expected prevalence of the disease or based on previous research, e=Margin of error (10%), $N=\{(1.96)^2\times 0.25\ (1-0.25)\}/(0.1)^2$, N=72.03

Considering the dropout rate of 10%; adjusted sample size=72+7=79. During the course of the study period, we were able to enroll 130 patients. As per the standard procedure, a detailed medical history alongside demographics data like age, trimester, parity, socioeconomic class, history of intake of antibiotic, history of UTI, any surgical history and presenting complaints were noted. Routine investigations like hemoglobin count, TLC, platelet count as well as urine routine and urine sensitivity tests were carried out. The urine samples were processed by department of microbiology by using standard loop method. If any significant bacteria were detected, patients were managed through an antibiotic and were followed up as per standard operating procedures. A bacterial colony count of $\geq 10^5$ CFUs/ml was identified as significant growth. These patients were followed till the delivery in order to note the outcome like ode of delivery, gestational age at delivery, birth weight of neonate, APGAR score as well as need of NICU admission. The data was collected using a predesigned template (Proforma attached). The data obtained from the proforma was entered into Microsoft excel. The outcome data was descriptively analyzed. The baseline patient characteristics were presented as frequencies for the categorical variables and as the means and standard deviations or medians for continuous variables. After appropriate data filtration, the datasheet was analyzed using Graphpad Prism (vs. 9.2.0). For comparing categorical data, Chi square ($\chi 2$) test or fishers exact test was performed. Results were considered statistically significant at a $p\leq 0.05$. Data collection was on paper. All the patient-specific data was kept in strict confidence. Patient identifiable data (name, contact, address, etc.) will not be presented in the journal or any public forum. Informed consent process was initiated prior to the individual agreeing to participate in the study and continuing throughout the individual's study participation. It was in a language understandable by each member of the study population. The protocol of the present study was submitted to the Ethics committee for review. After getting their approval, the study was initiated in the institution. Also prior to enrolling any patient in the study, a voluntary written informed consent was obtained for the participation.

RESULTS

Out of 130 patients, 43 (33.1%) patients had significant bacteriuria, 15 patients (11.5%) had Insignificant Growth and 72 patients (55.4%) had no growth in urine culture (Table 1). Among subjects with significant bacteriuria, majority (55.8%) were in the age group 18 to 25 years followed by 32.6% patients in age group of 26-35 years while remaining 11.6% were >35 years. While the patients with negative urine culture, 51.4%, 36.1% and 12.5% were in the age group of 18 to 25 years, 26-35 years and >35 years respectively. 36.1% and 32.6% in the patients with insignificant bacterial growth were in the age group of 18 to 25 years and >35 years respectively (Table 2).

The 56.9% and 53.5% in categories of normal urine culture and significant bacteriuria were in the third trimester while only 13.3% patients in the insignificant growth category were in the third trimester. The 26.4%, 20% and 37.2% from the normal urine culture, insignificant growth and significant bacteriuria respectively were in the second trimester. The 66.7% patients in the insignificant growth were in the first trimester (Table 3).

The 20.9% and 11.1% in the urine culture positive category and normal urine culture negative had previous history of UTI while none of the insignificant growth had history of UTI. Coming to other risk factors, 38.9%, 46.7% and 32.6% in the normal urine culture negative, insignificant growth and urine culture positive category respectively were anaemic. The 9.3% and 8.3% in the urine culture positive category and normal urine culture negative had diabetes mellitus. 19.4% in the normal urine culture and only 6.7% in the insignificant group had hypertension while it was 14% in the significant bacteriuria (Table 4).

All group had maximum numbers of normal vaginal delivery. For instance, 79.2%, 73.3% and 62.8% in the normal urine culture, insignificant growth and significant bacteriuria had normal vaginal delivery. Maximum instance of caesarean section was in the significant bacteriuria (37.2%) followed by patients with insignificant growth (26.7%) and negative urine culture (20.8%) (Table 5).

The 20.9% with the significant bacteriuria had delivered low birth weight neonates while it was 13.3% and 6.9% in the patients with insignificant growth and normal urine culture. None of the neonates in the insignificant growth category had low apgar score and NICU admission. While 9.3% each had low apgar score and required NICU admission in the patients with significant bacteriuria. While it was 2.8% in patients with normal urine culture (Table 6). The most common isolated organism was *E. coli* (44.2%) followed by *S. aureus* (27.9%), *Klebsiella* (11.6%), *Proteus* (7.0%) and equal incidence of *Citrobacter* spp. (4.7%) and *Pseudomonas* (4.7%) (Table 7).

Table 1: Distribution of urine culture sensitivity among subjects.

Sensitivity	N	Percentages (%)
Urine culture negative	72	55.4
Insignificant growth	15	11.5
Significant bacteriuria	43	33.1
Total	130	100

Table 2: Distribution of urine culture sensitivity among subjects with respect to their age.

Age group (in years)	Urine culture normal, (n=72)		Insignificant, (n=15)		Urine culture positive, (n=43)	
	N	%	N	%	N	%
18-25	37	51.4	9	60.0	24	55.8
26-35	26	36.1	4	26.7	14	32.6
>35	9	12.5	2	13.3	5	11.6

Table 3: Distribution of urine culture sensitivity among subjects with respect to their trimester.

Trimester	Urine culture normal, (n=72)		Insignificant, (n=15)		Urine culture positive, (n=43)	
	N	%	N	%	N	%
First trimester	12	16.7	10	66.7	4	9.3
Second trimester	19	26.4	3	20.0	16	37.2
Third trimester	41	56.9	2	13.3	23	53.5

* Significance: p=0.9623.

Table 4: Distribution of urine culture sensitivity among subjects with respect to risk factors.

Risk factors	Urine culture normal (n=72)		Insignificant (n=15)		Urine culture positive (n=43)		Significance
	N	%	N	%	N	%	
Diabetes mellitus	6	8.3	0	0.0	4	9.3	P=0.4847
Hypertension	14	19.4	1	6.7	6	14.0	P=0.4219
Anemia	28	38.9	7	46.7	14	32.6	P=0.6182
Previous history of UTI	8	11.1	0	0.0	9	20.9	P=0.0892

Table 5: Distribution of urine culture sensitivity among subjects with respect to type of delivery.

Type of delivery	Urine culture normal, (n=72)		Insignificant, (n=15)		Urine culture positive, (n=43)	
	N	%	N	%	N	%
Normal	57	79.2	11	73.3	27	62.8
LSCS	15	20.8	4	26.7	16	37.2

Table 6: Distribution of urine culture sensitivity with respect to fetal complications observed.

Fetal complications	Urine culture normal, (n=72)		Insignificant, (n=15)		Urine culture positive, (n=43)	
	N	%	N	%	N	%
LBW	5	6.9	2	13.3	9	20.9
Low Apgar score	2	2.8	0	0	4	9.3
NICU admission	2	2.8	0	0	4	9.3

*Significance p=0.8031.

Table 7: Distribution of most common isolated organism.

Organism	Frequency	Percentage (%)
E. Coli	19	44.2
Staphylococcus aureus	12	27.9
Klebsiella	5	11.6

DISCUSSION

ASB is not an uncommon disorder during pregnancy which is the causative factor of premature birth, low birth weight, postpartum UTIs leading to maternal, perinatal morbidity. Bacteriuria has a 20-50-fold increased risk of developing pyelonephritis as compared to women who do not have bacteriuria.[11] This perilous risk of pregnancy needs special attention, due to lack of symptoms and its fatal consequences in pregnancy. It is important to detect ASB in early pregnancy because 50% of untreated women develop complications.[11] Hence, the present study was designed to estimate the prevalence of ASB among pregnant women in different trimesters. In the present study, the overall prevalence of ASB was 33.1%. However, the reported prevalence was much higher in a study by Oladeinde et al with the prevalence of 55%.[12] Imade et al reported the prevalence of ASB as 45.3%.[11] Sujatha et al reported the prevalence of ASB as 47%.[11] The prevalence of ASB in Western studies ranges from 2-7%, in various Indian studies reported prevalence between 8-45%. In our study, the rate of infection was high in the third trimester 53.5% which was followed by the second trimester 37.5% and then the first trimester 9.3%. the 56.9% and 53.5% in categories of normal urine culture and significant bacteriuria were in the third trimester. Only 13.3% patients in the insignificant growth category were in the third trimester. The 66.7% patients in the insignificant growth were in the first trimester. There was no significant statistical difference between the groups (p=0.9623). This was similar to the results of the study by Rohini et al, Ramalingam et al and Saeed et al.[13-15] Sujatha et al observed that maximum number of culture positive cases were noted in second trimester 25 (53.19%), followed by third trimester 15 (31.9%) and first trimester 7 (14.89%).[11] Some studies have reported higher infection rate in the third trimester due to urine stasis in advancing gestational age compared to first and second trimester. Organisms causing UTI in pregnancy are no different than those observed in non-pregnant patients. In the present study, the common culprit organism observed was *E. coli* (44.2%) followed by *S. aureus* (27.9%), *Klebsiella* (11.6%), proteus (7.0%) and equal incidence of *Citrobacter* spp. (4.7%) and *Pseudomonas* (4.7%). Our findings are in line with the study by Agarwal et al reported the incidence of *E. coli* (39.2%), *S. aureus* (34.3%), *E. faecalis* (14.7%), *Klebsiella* (4.9%), coagulase-negative, *Staphylococcus* spp. (2.9%), *Citrobacter* (1.9%) and *Acinetobacter* (1.9%).[12] Imade et al reported the prevalence of *E. coli* (27.1%) was the most prevalence organism observed in the study, followed by *S. aureus* (24.4%).[13] Sonkar et al reported that *E. coli* (n=22, 61.1%) was the most predominant microorganism found in the study was followed by Cons (n=6, 16.7%), and S. aureus (3, 8.3%).[4] Edae et al observed that *E. coli* (44.6%) was the most predominant isolate followed by *Klebsiella* spp. (8.9%). The most frequently isolated gram-positive bacteria were Coagulase-negative *Staphylococci* CONS (28.6%) followed by *S. aureus* (10.7%).[15] Aliasghar et al reported that the most common isolate found in the study was *E. coli* (46.2%) followed by the *Staphylococcus* species (23.1%), *Klebsiella* (15.4%) and *Enterobacter* (7.7%).[16] Variation in studies may be due to differences in geographical location, socioeconomic status, study setting like primary care, antibiotic use, sample size and variation in screening tests as well as different cut-off points in the detection of the organisms.

Limitations

Few patients lost follow up during study. Study number was less.

CONCLUSION

The incidence of ASB was 33.1% which is still lower as reported in other Indian studies. Age, socioeconomic class and trimester were not found to be associated with ASB. Patients with obesity and primigravida were found to be statistically associated with ASB. Incidence of ASB was higher in patients with history of UTI and in hypertensive patients. No significant association was observed with the mode of delivery as majority had normal vaginal delivery. Incidence of LBW babies and low APGAR score was high in ASB group as compared to another counterpart. The most common organism isolated was *E. coli*, followed by *S. aureus, Klebsiella, Proteus*, and equal incidence of *Citrobacter* spp. and *Pseudomonas*. Pregnant women should undergo periodical screening from the first prenatal visit itself which can help in averting fatal outcome.

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